

The IBM Data Centre  
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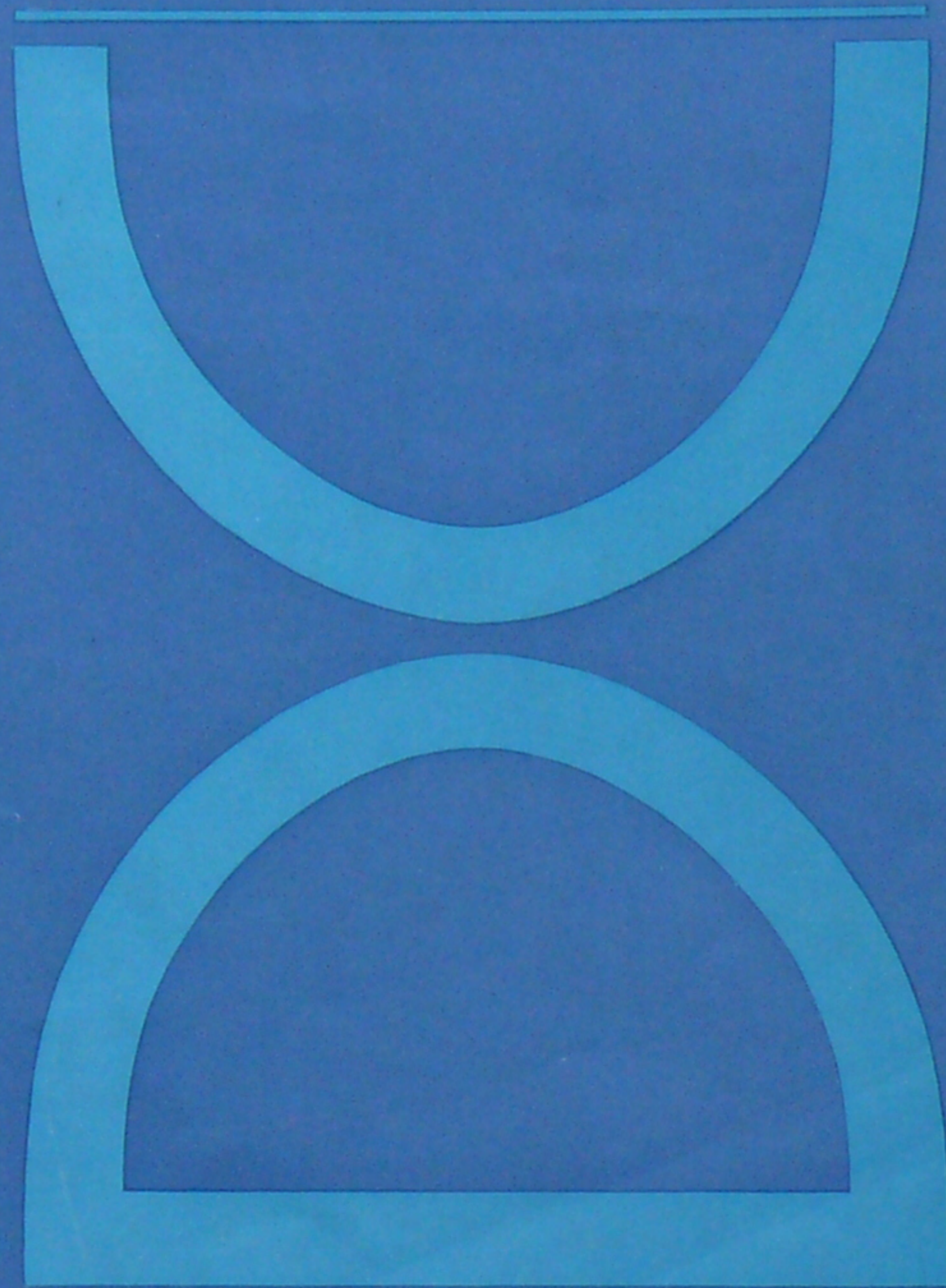
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*Des Salomon, Nottingham — Len Cowley?*

*Ron Horrocks  
now back in  
Canada*

The IBM Data Centre enables  
you to hire computer time  
and pay only for the actual time  
used, however short.





## The IBM Data Centre

IBM has been concerned with all aspects of data processing for half a century, and from the beginning of the second world war has been a pioneer in the development of electronic computers. As a result, IBM's accumulated experience in this field is second to none.

The IBM 7090, latest in the line of large-scale IBM computers, is the most powerful data processing system generally available in the world today. The more powerful the computer, the more it costs; but because the cost rises much more slowly than the power, the job-cost - how much it costs to do a particular job - comes down steeply.

With its exceptionally high speed, its large capacity and its great versatility, the IBM 7090 would be an ideal machine for a wide range of scientific and commercial applications in this country. But before any data processing equipment can economically be installed, there must be enough work to keep it in use for a high proportion of the time. In the case of such systems as the IBM 7090 the economic volume of work is, of course, very high, and few organisations are in a position to take advantage of its low job-cost by installing their own system.

But this limitation is removed if, instead of installing his own machine, the user hires computer time and pays only for the actual time used, however short.

To bring the low job-cost of large-scale systems within the reach of organisations of all sizes, IBM has been opening a series of Data Centres based on its most modern and powerful equipment. Five such centres are already in full operation in the United States, and another in Paris.

Now a new Data Centre is open in London. It is based on the IBM 7090 with an auxiliary 1401 system, giving British commerce, industry and research direct access to a computing centre as powerful as any in Europe.

### Customer usage operation

The operation of the London Data Centre is geared to the needs of the ever-increasing number of organisations who want to play a more active part in the processing of their own applications, but who want to pay, at an economic rate, only for the machine time which they actually use.

A key to this method of operation is the term 'customer usage'. IBM specialists in the Data Centre provide the user with the necessary education, advice and assistance in all aspects of programming and operating the equipment. The machines, installed and maintained by IBM, are made available to him as and when he needs them. But the customer keeps in his own hands the programming and the processing of his own jobs.

Thus the Data Centre user has most of the facilities that are available to organisations with their own data processing system, without having to fit out his own computer room, and without having to pay for the time when machines are standing idle. Yet he retains full control over all phases of his data processing - after all, he knows his own job better than anybody else; and he can learn how to apply IBM data processing techniques to it more easily than he can teach a specialist programmer the intricacies of his accounting procedures or his scientific calculations.

An IBM Data Centre  
has now opened in London





The experience gained at the Data Centre in programming, program testing and operating becomes invaluable if the Data Centre user later decides that his volume of work now warrants his own installation.

Many users of IBM equipment have found a bonus: the very process of examining clerical or technical procedures and reducing them to terms suitable for automatic data processing suggests ways of making them more efficient.

Your intimate knowledge of your own organisation, backed up by the educational facilities, advice and assistance given by IBM specialists, enables you to take advantage of really advanced electronic data processing methods on the most economical basis.

## The Hardware

The IBM 7090 is the most powerful computer in general use today. It has been used in nuclear research, in mathematical analysis of every description and in numerous simulation studies. Whether it is a new design to be appraised, a production process, a sales campaign or a traffic pattern, the vast capacity and very high operating speed of the 7090 enable it to tackle calculations which could not be considered by other means. It can condense into minutes or hours of machine time processes stretching over years or centuries. Thus modern techniques remove prediction from the realm of guesswork (however inspired) and put it on a firm scientific basis.

Yet so versatile is the 7090 that it can equally well be used for the more routine computing and data processing jobs required by science and business.

IBM 7090 systems can be built up in many configurations to suit different requirements. That at the Data Centre consists of 25 inter-connected units, including 12 magnetic tape units.

The central processing unit contains the logical, arithmetical and program control circuitry. There are over 200 program instructions available to the 7090 programmer, 30 of which are executed in only 2.18 microseconds (millionths of a second). This is also the time taken to read in or read out any of the 32,768 words in core storage, each word consisting of 36 binary bits (approximately equivalent to 10 decimal digits). Numbers of average size can be multiplied in less than 24 microseconds, and divided in about 30 microseconds - an indication of the very high calculating speed of the 7090.

The Data Centre system has two independent data channels, both of which can be used for input or output while the central processing unit is simultaneously performing arithmetical and logical operations. All data switching is controlled by the Multiplexor, to which the 7090 owes much of its flexibility of operation.

On each data channel there are six IBM 729 IV magnetic tape units. Data can be stored on magnetic tape either in binary form (the form in which the 7090 com-

A piece of magnetic tape of this size will contain all the words in these two paragraphs. It can be read by the 729 IV in nine milliseconds (thousandths of a second).

For problems  too

**NO**

for your normal methods



putes) or in BCD (binary-coded decimal). Magnetic tape units offer input/output speeds up to 62,500 BCD characters, or 375,000 bits, per second.

Although the 7090 system does include an on-line card reader, card punch and a printer, input and output will normally be by means of magnetic tape, since its read/write speed enables greater advantage to be taken of the power of the computing unit.

An IBM 1401 system is available for the preparation of input tapes from cards and for the conversion of output tapes to punched cards or to printed documents. This method of operation offers the most efficient use of the powerful 7090 by leaving it free for high-speed tape-oriented processing, unhindered by slower card or printer input/output.

Although the 1401 is a versatile smaller-scale computer in its own right, that at the Data Centre is intended primarily for off-line operations, for which it is well suited by its very fast card input/output speeds: card reading at 800 cards a minute; line printing at 600 lines a minute; and card punching at 250 cards a minute.

## Programming

Since computer programming in the numerical form used by the machine is lengthy, tedious and very prone to error, IBM has always placed great importance on programming systems which allow a programmer to write his program as easily, as quickly and as accurately as possible. To this end he uses symbolic rather than numerical instructions, and also benefits from the use of macro-instructions, where one written instruction generates a number of program steps.

### SHARE Operating System

SHARE is an organisation of IBM 704, 709 and 7090 users who have combined to pool their experience and, acting as a consumer association, to advise IBM of their needs.

The SHARE Operating System (SOS) is a very flexible system of symbolic language instructions and routines, devised by IBM to meet the needs of SHARE members in simplifying the tasks of both programmer and operator. It can be divided into four main parts: SCAT, modify and load, debugging and the supervisor.

SCAT (SHARE Compiler Assembler Translator) provides the symbolic codes which make programming simpler, and the macro-instructions which cut the length of programs. Modify and load enables alterations written in symbolic form to be incorporated in a machine-language program which has been produced by a previous compilation. Debugging produces 'snapshots' of the core storage taken at any time during the execution of a program, or a print-out of the data on any magnetic tape used. The supervisor, as well as allowing any number of programs to be processed in one run, also provides a number of input/output routines, including conversion between different number systems.

For the operator, SOS largely standardises operating procedures for different

3 mp 4  
2 o 5  
c 6  
ex 7  
For problems too ↑

for your normal methods



jobs. It takes action automatically as far as possible, and prints out information for the operator during the execution of a batch of programs.

### **FORTRAN**

FORTRAN, standing for FORMula TRANslation, is a programming language so similar to normal mathematical notation that it can be learnt very quickly by a trained scientist or engineer. This easy-to-learn and easy-to-write programming system reduces clerical errors and highlights the logic of the problem. It produces a program almost as efficient as a 'custom-built' program taking several times as long to write.

FORTRAN is available at the Data Centre within the FORTRAN Monitor System, by means of which FORTRAN programs can be translated and processed in the same run. The Monitor also allows any number of FORTRAN programs to be processed in one run, with consequent savings in machine time. Like SOS, it also simplifies operating procedures.

### **Utility programs**

There are a number of utility programs for both the 7090 and the 1401. These include programs for such routine operations as tape sort and merge, and card-to-tape, tape-to-card and tape-to-printer operations.

## **Program library**

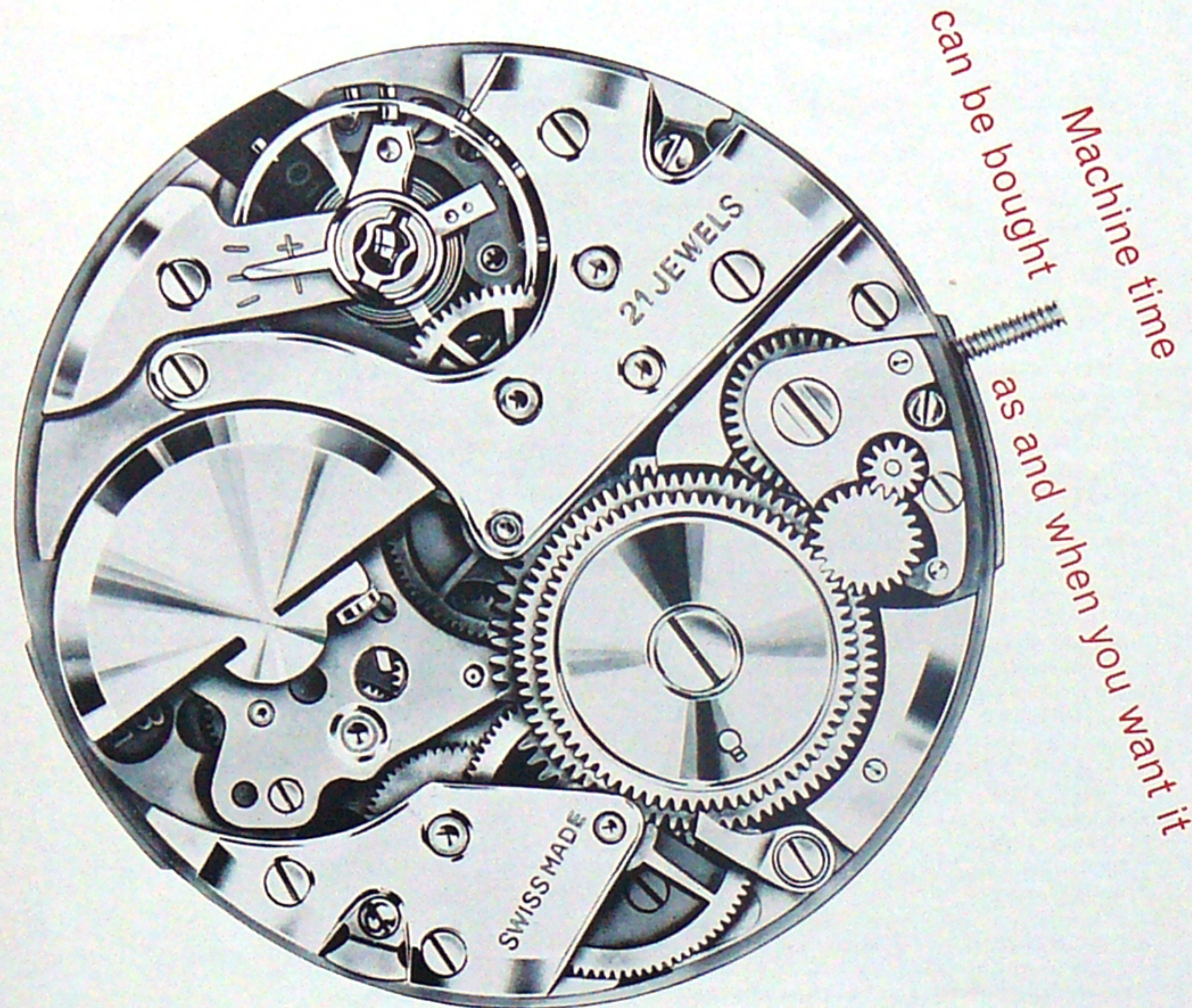
We have already mentioned SHARE, the organisation of 704/709/7090 computer users to which the Data Centre belongs. Amongst its facilities is a very large library of programs that have been written and used by SHARE members and contributed for the use of other members. Many of these are actually held at the Data Centre, and any in the comprehensive catalogue can be obtained at short notice.

Obviously the availability of such a large collection of subroutines and programs can save a lot of programming time. While IBM cannot guarantee the suitability of a library program for a particular job, any more than a reference library can guarantee the accuracy of the books it holds, library programs can often be used without modification, especially in scientific work.

The Data Centre Program Librarian will be pleased to discuss what this free reference library can offer, and the Data Centre specialists will give advice on the use of the programs.

## **Who is the Data Centre for?**

The Data Centre can prove invaluable to the existing computer user no less than to the organisation which has not yet made use of electronic data processing.





A problem that occurs in all data processing installations is that of peak loads. It would be uneconomic to install further equipment simply to cope with occasional peaks, yet they can upset the routine and make overtime working necessary. This problem can be solved without over-equipping the installation if the peak loads are absorbed by hiring time on the powerful machines at the Data Centre. By this means quarterly or annual reports, for example, can be produced without interfering with the normal routine of payroll, invoicing, stock control or production control.

The installation which is primarily used for scientific or engineering computation faces rather different problems. There too peak loads occur, though at less regular intervals, which can be dealt with by recourse to the Data Centre. But the scientific installation has another problem, more peculiar to itself. Its own 'hardware' will be sufficient for most of the jobs required of it, but some applications will probably prove too big for the machines. To scale down the problem to fit the hardware may well detract from its usefulness, and it will often be better to keep the problem in its proper form and make use of the 7090, which is capable of accommodating the largest and most complex applications.

There are many organisations which do not yet make use of electronic data processing, either with their own installation or by contracting out their work.

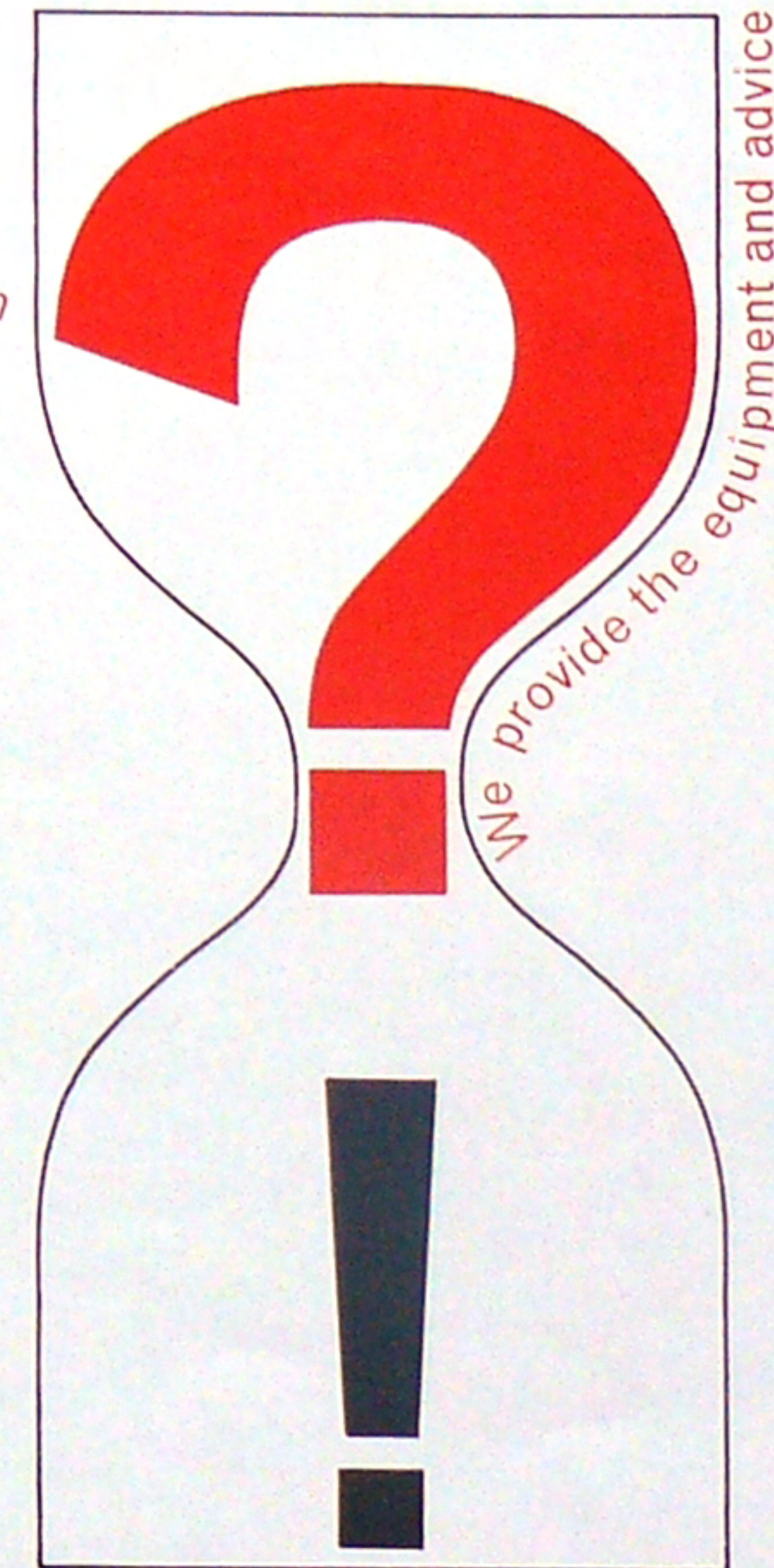
Electronic computers were developed in the first place for scientific calculating work, yet many trained scientists are still expected to spend a good deal of their time in tedious calculation. When one considers that the IBM 7090 can do in seconds what would take weeks to do on a desk calculator, or years on paper, then the enormous savings in man-power become apparent. Indeed, much of the calculation required in scientific work today just would not be practicable by any other method, because of the enormous time it would take. Given up-to-date tools the scientist or engineer is freed from mechanical chores and can make real advances in his own field.

Many companies are deterred from making use of what they recognise to be efficient equipment by the thought of what calls their own installation would make on their space and capital, or by doubts as to the size of installation that would best serve them.

Here the Data Centre can be of service in providing the data processing facilities on a purely time-usage basis. The customer gains the benefits of modern techniques: the speeding-up of information handling, the quick and accurate production of such 'working paper' as invoices or payslips, accurate and up-to-date reports, and compact storage. He uses programming and operating staff who know his own work, and IBM supplies the machines, charging only for the time they are actually used.

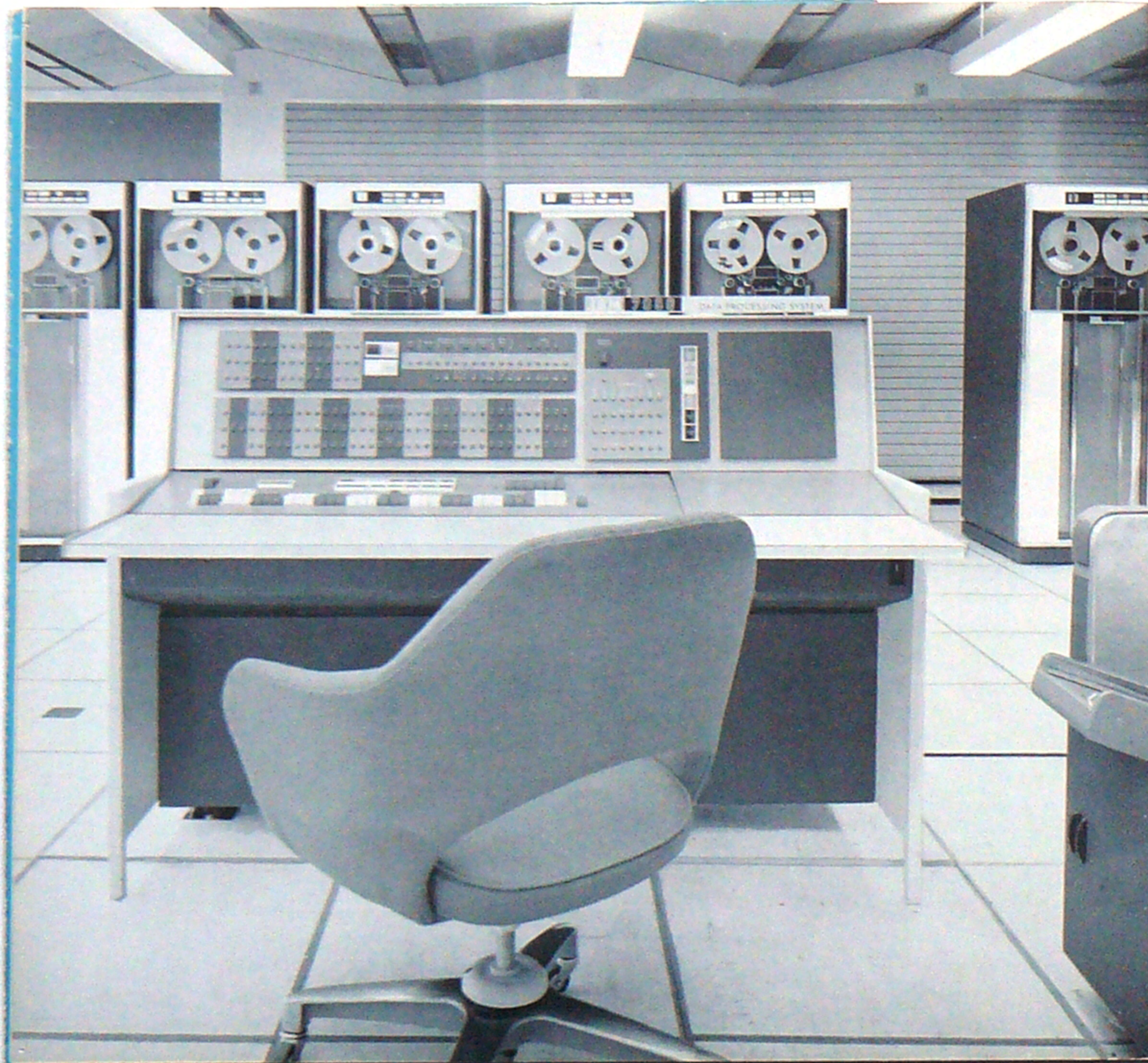
On a shorter-term basis, the customer may wish to use Data Centre facilities for a time to gain actual experience in the techniques before deciding exactly what equipment he himself should install, or indeed whether he should install at all. However, after experiencing the benefits of electronic data processing few people will willingly go back to manual or semi-automatic methods.

*You provide the problem*



*You use the equipment and  
pay only for the time you use*





## How to use the Data Centre

So far we have tried to give you an indication of the power and flexibility of the equipment at the Data Centre and to show the basis on which it is operated, with some reference to the educational facilities and advice provided.

This will not have been enough to make you decide to use the Data Centre, but we hope that we have at least aroused your interest.

Of course we do not claim that every organisation would increase its efficiency by using the Data Centre. Some are well served by manual methods, and for others punched card equipment remains the most economical. We do claim, however, that you could well learn more about this new IBM facility before reaching a decision.

### Seminars

From time to time the Data Centre holds management appreciation seminars to demonstrate the equipment and other facilities available, and the ease with which IBM programming systems can be learnt. These seminars last a day or two. If you can spare the time, the knowledge you gain and your informal discussion of possible applications with Data Centre specialists put you in a better position to judge for yourself whether you can benefit from the Data Centre. If you cannot come yourself, you can send a member of your staff to one of our programming appreciation seminars, at which the various programming systems are discussed in greater detail.

### Education

If you decide that the Data Centre can be of service to you, the next step is to send members of your staff on a programming course. This will last from one to four weeks. On this course they will have a chance to prove the ease of programming by running 7090 programs that they have written themselves.

There is no charge for these courses, nor does attendance at them oblige you to use the Data Centre if more detailed study of your application shows that it is not suitable.

### Advice

After attending a programming course your personnel will have sufficient knowledge to begin programming your applications. They will not yet, of course, be expert programmers, but they will continue to have the benefit of advice from the Data Centre specialists. This advice will cover the use of the various programming systems, programming techniques, how to get the best out of the Data Centre's large program library, and the many other things that will mean the most efficient use of the 7090.

We regard this service as an extension of our educational facilities, and make no charge for general advice of this nature.

### Debugging and Operating Assistance

When they come to test and run their first programs on the 7090 your programmers will have the assurance that the advice and assistance of IBM specialists is at their disposal. They will have advice on the most efficient debugging and operating techniques, and help if help is needed. In fact, IBM operators will operate the equipment for you if that is preferred. This assistance too is, of course, provided free of charge.





## Layout of the Data Centre

This plan shows the layout of the ground floor of the IBM Data Centre at 58/62 Newman Street. On the next floor there is some office accommodation for the convenience of our customers, as well as the Program Library and other facilities.

### 7090 Data Processing System

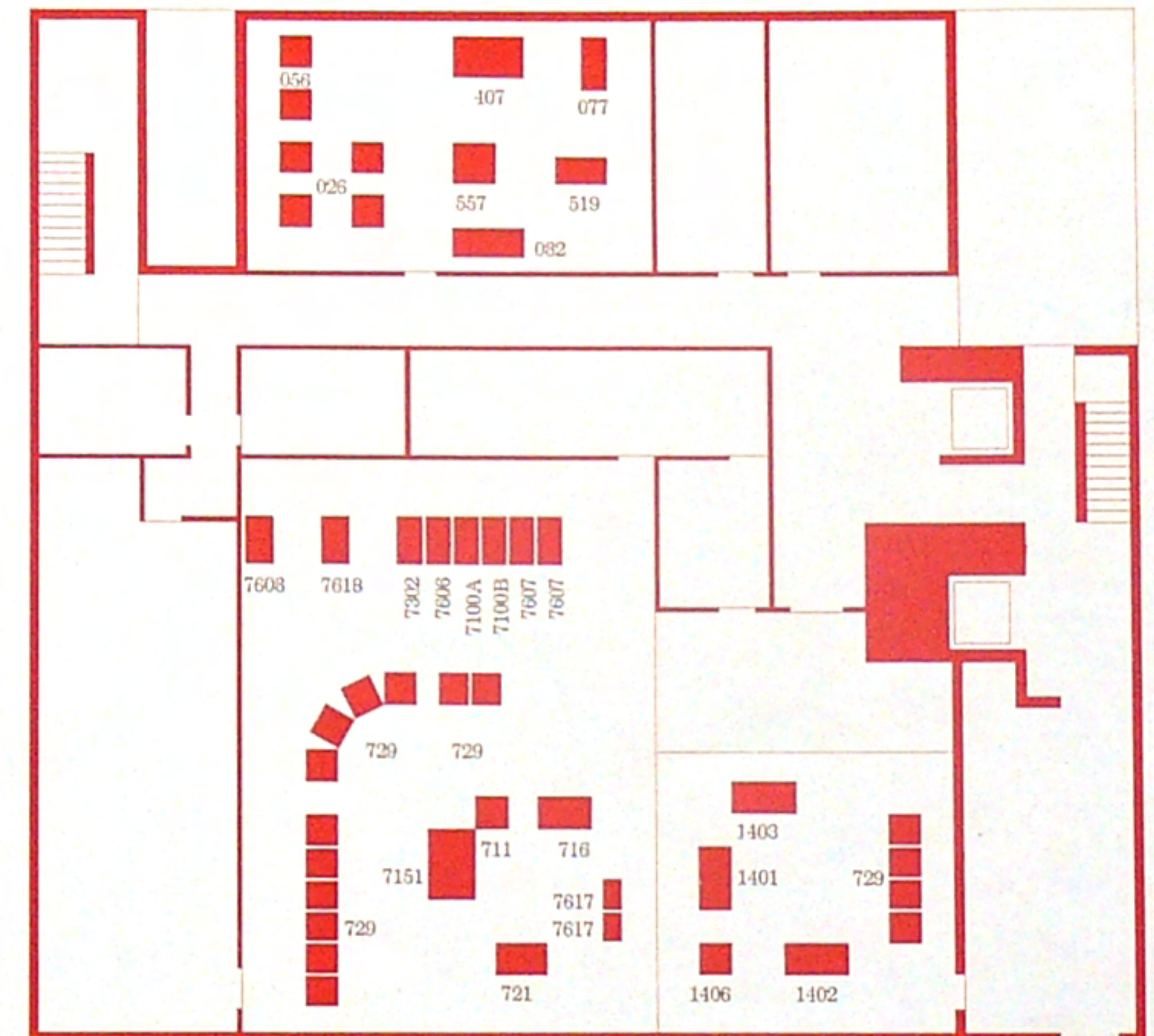
- 7100 Central processing unit
- 7302 Core storage
- 7151 Console control
- 7636 Multiplexor
- 7607 Data channel
- 7617 Data channel console
- 711 Card reader
- 721 Card punch
- 716 Printer
- 729 IV Magnetic tape unit
- 7608 Power converter
- 7618 Power control

### Auxilliary 1401 System

- 1401 Console and control unit
- 1402 Card read punch
- 1403 Printer
- 1406 Additional core storage
- 729 IV Magnetic tape unit

### Supporting unit record equipment

- 026 Printing card punch
- 056 Verifier
- 077 Collator
- 082 Sorter
- 407 Accounting machine
- 519 Reproducer
- 557 Interpreter





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won DCS kit  
1970 - then  
1400 programming  
advisor.



